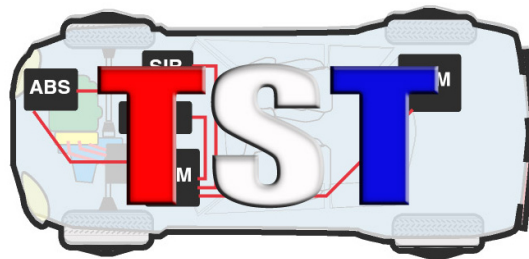


October 2019



Technicians Service Training

INSIDE THIS ISSUE:

"A Collection Of Shop Experiences With European Makes" P. 1 - 24

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"G" Jerry Truglia

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"A Collection Of Shop Experiences With European Makes"

Let's start our trip across the pond with a BMW that is one of the most commonly sold Euro vehicles in our country. A 2012 BMW X5 came into our shop from a recommendation from another one of our customers. The lady that owns this BMW had taken the vehicle to the BMW dealer already and was not satisfied with the repair that was performed.

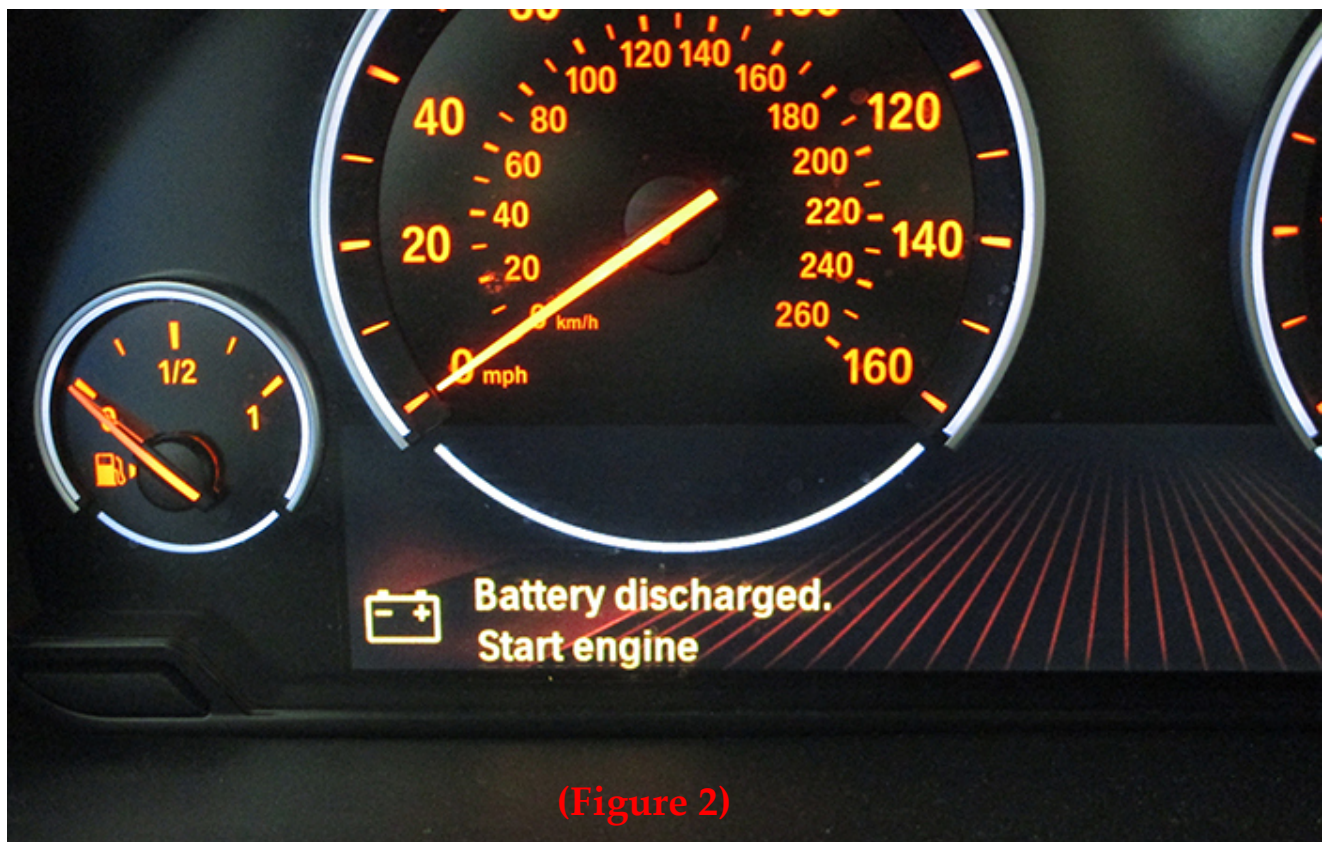
The problem on this X5 was that the vehicle's battery would go dead in a couple of days. Now if you're thinking that this dead battery was caused by something that they missed such as a parasitic draw, you're correct. Take a look at the dash display warning messages (**Figures 1 and 2**) that were displayed as a result of the problem.



(Figure 1)

(Con't on page 2)

"A Collection Of Shop Experiences With European Makes"
(con't from p. 1)



(Figure 2)

The dealer had recommended that the battery and alternator be replaced in order to solve the problem and performed the repairs. Unfortunately, after the repairs were performed the vehicle still had the same problem it had prior. She brought the vehicle back to them a couple of times but they were, for some reason, unable to resolve her concern.

We started our diagnosis at the most important electrical power component in any vehicle, the battery. We found that the battery was low after performing a battery, starter and alternator test. The Midtronic battery test results stated the battery needed to be charged and retested. Our next move was to attach our Associated battery charger and set it to the AGM setting to charge the battery up to specifications. After the battery was fully charged, we repeated the battery test, but the battery failed once again. We charged the battery one more time before we condemned it.

But before we called the vehicle owner, we installed one of (Con't on page 6)



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John Thornton of Autotrain Inc.

Wayne Colonna of ATSG

Jorge Menchu the “Labscope Guru,” AES Wave

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Mark Warren of World Pac / Motor Magazine

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"A Collection Of Shop Experiences With European Makes" (con't from p. 2)

our new AGM batteries so we could continue our check of the starter and alternator. There is nothing worse than calling a customer multiple times and telling them each time you found something else wrong. My lead tech Bill had also performed a vehicle scan to check for codes and battery registration. Since there were no codes and the battery was properly registered, the problem had to be elsewhere. With a new battery installed, Bill proceeded to retest and continued to look for the problem. The issue he found was not with the alternator but rather a problem with the negative battery cable current sensor. Now we felt comfortable calling the customer and recommending that the battery and the battery cable current sensor both be replaced.

The BMW owner refused to provide the information for the battery warranty and told us just to replace the battery since she no longer wanted to deal with the BMW dealership. We followed her request and installed a new battery and negative current cable before starting to test for a parasitic draw.

Bill proceeded to test for the parasitic draw by installing the shop's **(Figure 3)** Fluke 233/A meter along with our Fluke i30s amp clamp. The amp clamp has a big enough jaw opening to fit around all battery cables that we have encountered so far. The Fluke i30s amp clamp is our tool of choice for parasitic draw since it can accurately measure current with a resolution of 1 mA / 5 mA up to 30 A. Since the amp clamp sensitivity range is 100 mV/A (100 millivolts equal 1 amp) our reading on the meter **(Figure 4)** is not interpreted by using the decimal point but rather by just reading the 3 digits. This is a very confusing problem for technicians when they use an amp clamp on a meter. I have seen this confusion for years both in seminars and hands on classes, so in both my electrical and scope books I make sure to highlight the use of an amp clamp on a meter.



(Con't on page 7)

"A Collection Of Shop Experiences With European Makes" (con't from p. 6)

On this vehicle Bill selected to use the millivolts scale on the meter since it's the most accurate and can read up to 600 mV (6 amps). If the meter's display reads OL, the limit has been exceeded. Then all that needs to be done is to move the meter dial to the voltage position and read the display. On our X5, the maximum milliamps reading is 40 mA, anything over that indicates a problem. The reading that our meter displayed on this X5 was 26.5 (Figure 5) milliamps but rather 2 amps 650 milliamps - that is way over the 40 milliamp maximum tolerance! Can you see why the new battery that the BMW dealership installed was draining down and went bad? Our next step was to find out where the problem was coming from. We could have started our diagnosis by disconnecting the alternator since a shorted diode can cause a draw, or voltage drop each fuse, or last but not least disconnect one fuse at a time. All those methods have been used for years but take time to perform. We found a better method allowing us to be more proficient was by using our thermal imager on a cold vehicle.

We checked all around the vehicle until we found a bright color on the thermal imager screen.

Take a look at the short video that we shot on the X5 to get a better idea on



how helpful using a thermal imager can be. Go to our

(Con't on page 10)

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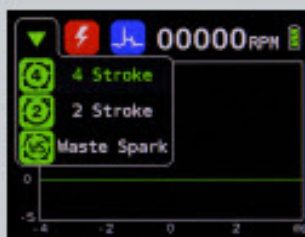
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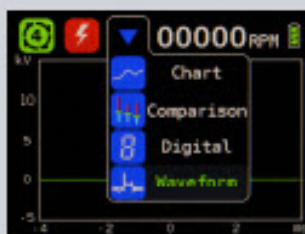
Displays secondary ignition waveforms.



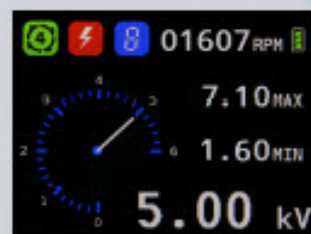
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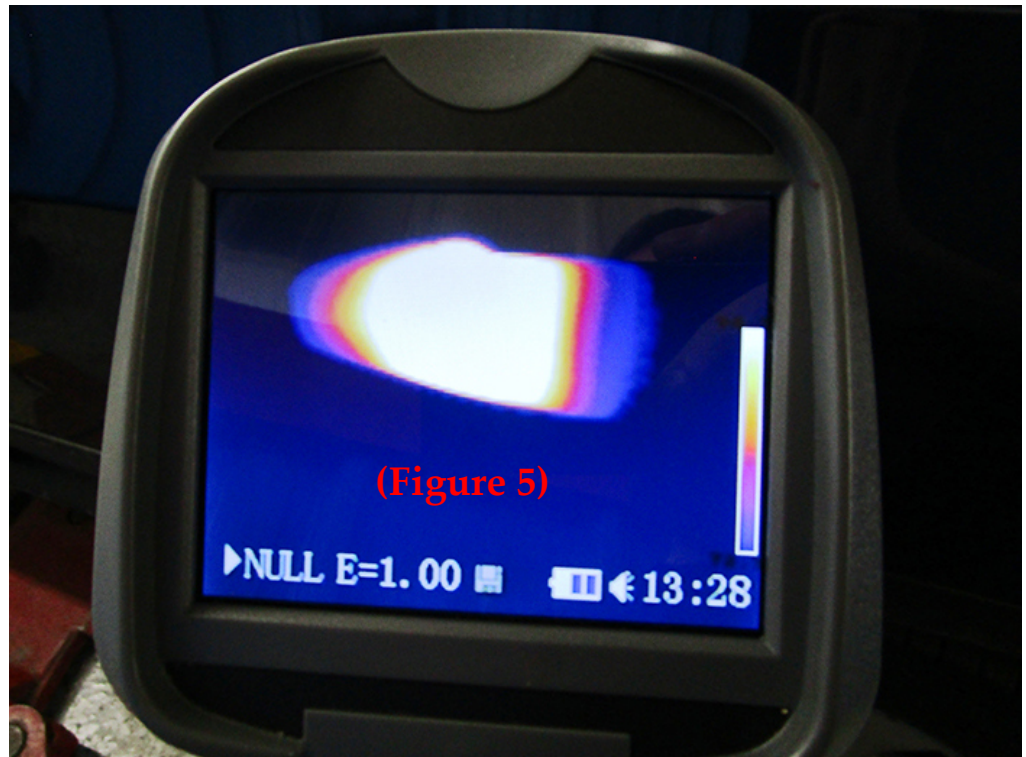
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"A Collection Of Shop Experiences With European Makes" (con't from p. 7)

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Using the thermal imager, we were able to check the alternator and fuse boxes, followed up by looking all around the vehicle. We found the driver rear door handle was causing the thermal imager to glow a bright yellow **(Figure 6)**, indicating a draw. If you're not familiar with the Passive Entry door handles on a BMW, I will explain.

BMW uses special door handles on some of their high line trim models called the Comfort Access System or CAS for short. The first vehicles that used this system was the BMW 7 series. The system uses a Passive Entry that allows the driver to open up the



trunk or door without using the vehicle transmitter/fob. Passive Go is another part of the system that allows the driver to start the engine without using the transmitter and Passive Exit, closes in some cases and locks the vehicle, without using the transmitter. The door handle has a sensor that sends a signal to the CAS, allowing the door to be unlocked when the handle is touched. The CAS has many other functions on this vehicle but the one we were concerned with is the door handle.

We proceeded to remove the door panel, followed by

(Con't on page 11)

"A Collection Of Shop Experiences With European Makes" (con't from p. 10)

removing the wires from the load - the door handle actuator/sensor. With the wires disconnected from the door handle we rechecked the current draw on the meter. The draw was now under 40 milliamps, indicating that we found the source of the draw that caused the battery to go dead. We had to wait to use the thermal imager to check the door handle since the handle was still hot as the result of a shorted actuator/sensor in the handle.

When we returned to recheck the door handle the imager displayed no draw by matching a blueish color on the screen that was equal to the other 3 door handles. We called the vehicle owner to explain what we had found, unfortunately she decided to have us just leave the door handle disconnected since it would still function normally except for touch open and auto lock. We released the X5 to a happy customer that no longer had to deal with a dead battery or the stress of hoping the vehicle would start.

A BMW MIL

Next is a 2004 BMW 745i N62 that came in with a Check Engine light illuminated along with a few other issues. Even though this Bimmer had 172K miles on it, the vehicle owner still wanted to repair it. He had already tried Seafoam, a chemical carbon cleaner, and then taken his vehicle to an after-market BMW shop. The BMW shop tried to resolve the problem by using other professional carbon cleaners to clear the clogged Secondary Air passages in the cylinder heads. The results were not what the 745i owner wanted to hear or for that matter see, the codes came right back and illuminated the Check Engine Light. The shop recommended removing the cylinder heads to properly clean the passages and keep the MIL off. The Bimmer owner did not like what he was told and went for a second opinion. The second opinion was given by the BMW dealer who also recommended the same course of repair. Since we had worked on his BMW in the past, Robert decided to give us a call and see what we thought. After speaking and emailing us a few times he had decided to drive from Ohio and have us diagnosis and

(Con't on page 14)

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repair his 745i.

We did not want to let this customer down and knew that if we could not properly clean the air passages the Check Engine light would once again illuminate and we would look bad and have an unhappy customer. When the vehicle arrived, we connected our scan tool and performed a full vehicle scan that came up with the following DTCs 170 10080 (P0491) and 171 10081 (P0492) - Secondary Air Injection Insufficient Flow Bank 1 and Bank 2. This was the same information the other shop and BMW dealer had diagnosed. We had already done some research on this BMW Secondary Air problem and came up with a different solution that we found on the AGA tool website. Since we had used AGA tools on other BMW problems with great success, we thought that it was worth a try.

We explained the option to our customer, Robert, and asked him to review the AGA video. The video had a good explanation of the problem and the solution on cleaning the air ports on a 745i N62 motor. We explained to the owner that this was a less expensive way to clean the sixteen air injection ports without removing the cylinder head. Even though this is a time consuming job it is way easier and cheaper than removing the cylinder heads.

The first step of the procedure is to install the AGA BMW Secondary Air N62 tool and funnel (**Figure 7**) followed by pouring a carbon cleaner down into the



secondary air tubes. The cleaner we chose to use, Run-Rite, was the same one that we have been using for years on carbon issues and has always yielded us good results. We started by removing the air tube on Bank 1 first (right/ passenger side) and proceeded to pour the cleaner down. We then followed this by performing the

(Con't on page 20)

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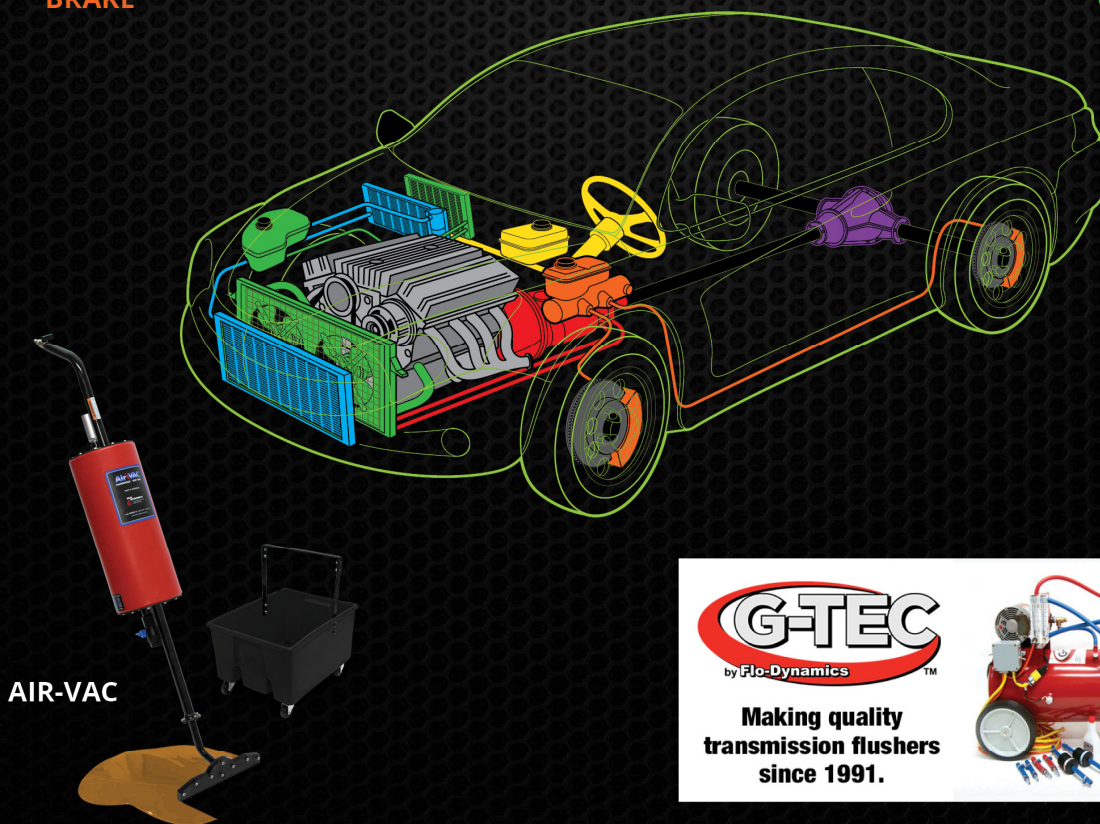
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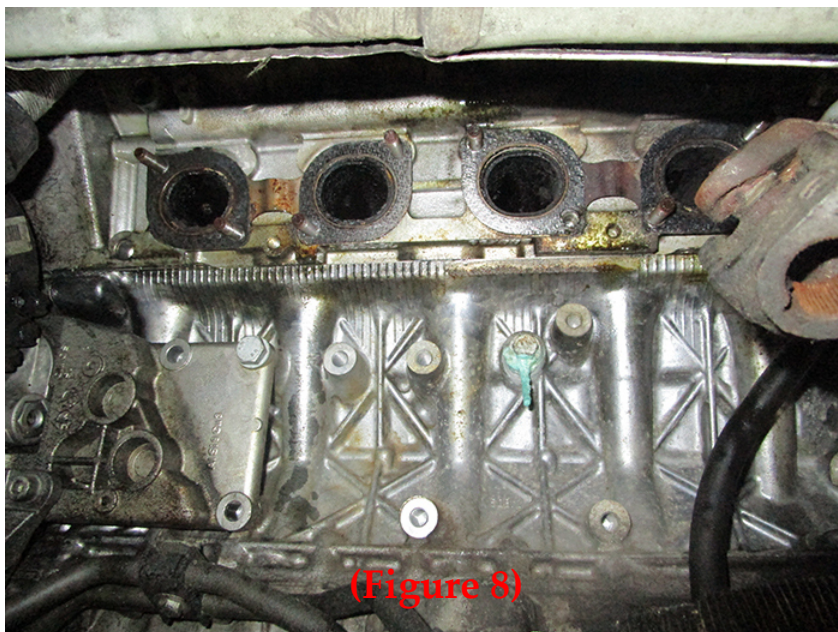


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same process on Bank 2. We ran the engine and then let it sit a bit before re-starting it then drove the vehicle. There was a load of smoke on our test drive that exited the exhaust system that meant it must have cleaned up some of the carbon. This is the first step of the AGA suggested cleaning process but may not be the last.

If this procedure does not break up all the carbon and the MIL illuminates for the same DTC, then phase two must be performed. As luck would have it, the procedure did not fully work even though the MIL stayed off for a few test drives. We informed the owner that we recommended a repeat of step 1 for the next course of action to see if the results were any better. Unfortunately, the results did not solve the problem so that meant step two of the cleaning process needed to be performed. Since Robert has been a very good customer over the years, we provided him with our shop loaner vehicle so he could drive back to Ohio.

We knew that we had our work cut out for us since our two upper secondary air port cleaning only made a small difference. The carbon was going to be extremely hard and difficult to remove. AGA makes two different cutting hooks that can be used to break the carbon from the passages. One of the hook tools is more rounded at the tip and the other is more squarish and looks more aggressive.



(Figure 8)

The next step was to secure the engine, remove the exhaust, drop the engine cradle and exhaust manifolds so we would have enough room and access to properly clean the air ports. As you can see from the picture **(Figure 8)** the air ports are clogged with carbon.

(Con't on page 21)

"A Collection Of Shop Experiences With European Makes" (con't from p. 20)

This was a time consuming job that took hours of hand cleaning one port at a time. I started by selecting what I thought was the worst looking port so I As I proceeded to clean the first port, I encountered heavy resistance so I decided



to spray an intake cleaner as I was digging (Figure 9) and poking the tool into the port. After some time and much effort, I had success in cleaning the first port (Figure 10). Now I knew what I was in for cleaning the other ports.

In the process of cleaning the other ports I wore out and broke a few of the hook ends. We called AGA and they overnighted a few more replacements just to make sure we would have enough to finish the job. While we had the vehicle apart, we noticed there was an oil leak from the rear main seal and others from the oil pan. We suggested to Robert that since we had access to the pan, we remove the transmission and replace the rear main oil seal and oil pan gasket. Our customer is a mechanical engineer who is super fussy and likes everything replaced. Robert had us order new oil pan bolts, new control arm cradle bushings and bolts, front transmission seal, transmission pan gasket and pan bolts and so on. It looked like Bill and I were going to replace everything from the starter to oil lines and just about everything else.

As an engineer Robert understands the stress that each (Con't on page 24)



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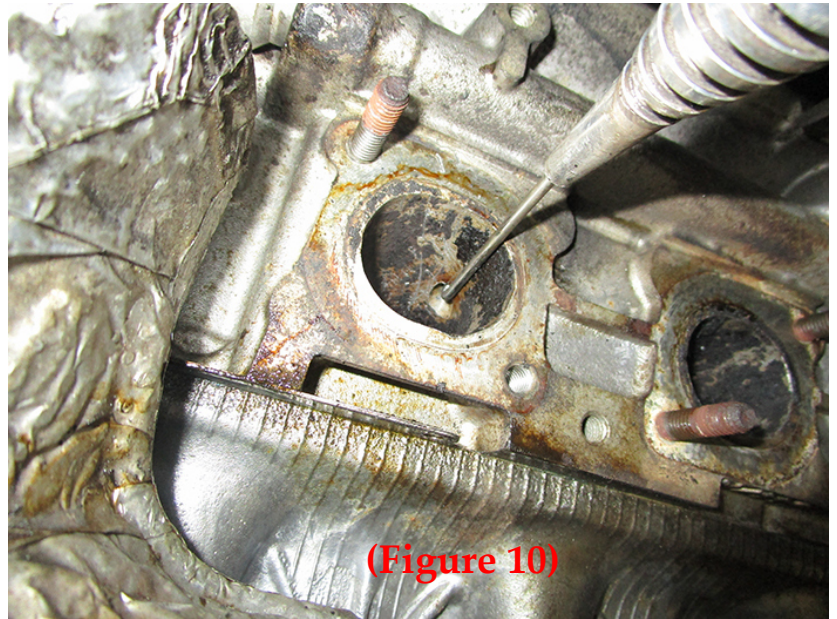
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component has to go through with hot and cold, never mind the mileage that was on his 745i.

After waiting for three weeks or more, the bolts finally arrived from BMW and the time had come to re-install everything we had taken apart. This vehicle was now in Bill's bay for over a month, we thought that Robert was going to have us replace just about everything we touched. Now we had to make sure the Secondary Air Ports were flowing freely. We connected our Power Probe Hook since we needed amperage capability to run



the Secondary Air pump. With the Hook connected we operated the pump to make sure all the air ports were able to blow a good stream of air. Check out these videos of the air pump and ports: <https://www.youtube.com/watch?v=qEBlcNTjiVU>, <https://www.youtube.com/watch?v=mx5WpqPEEss>.

After our successful test of the air ports we were able to install the exhaust manifold, starter, engine cradle, exhaust system and suspension components along with all new hardware. We started the BMW up and drove the vehicle for a week to make sure that the MIL would no longer illuminate. The 745i was now fixed and running well without the MIL illuminating.

*Article By
"G" Jerry Truglia
TST Founder and President
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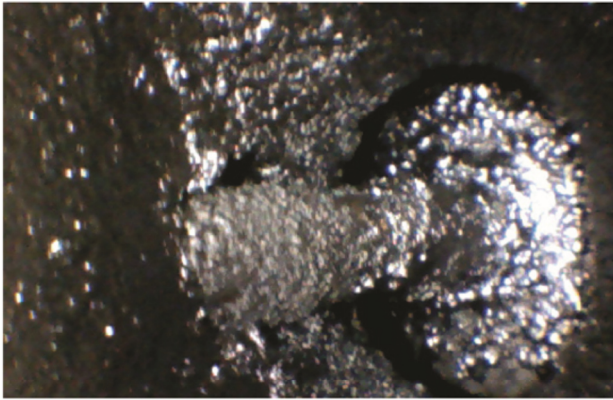


Finally...

A Cleaning Solution That Actually Works!

1.6L Turbo Mini Cooper at 83,000 miles

Before Cleaning



After Cleaning



3C Intelligent Induction Cleaner

Patent Pending

3C Intelligent Induction Cleaner (Patent Pending) removes heavy carbon deposits from the internal combustion engine's induction system in just 20 minutes.

Air Assist Injection Nozzle (Patent Pending) delivers chemical in small droplets that are suspended and carried to the carbon deposits by the engine's air flow. This air assisted nozzle is superior to any other nozzle available for carbon removal.

Chemical Layering (Patent Pending) removes more carbon because it alters the application of chemical mixtures between chemical A and Chemical B in on/off cycles, then washes the induction system with Chemical C.

Micro-Burst Injection Technology (Patent Pending) delivers the maximum amount of chemical during the cleaning process while still allowing the engine to run well.

3C Chemical A, 3C Chemical B, 3C Chemical C (Patent Pending) are laboratory proven to remove more carbon weight from different carbon types than any other commercially available induction carbon cleaning chemical, while having a low HMIS health rating of (2).